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ABSTRACT

This paper examines the applicability of net tuition revenue models for a highly selective, elite priced, private research university in the southern U.S. Pricing and aid strategies for this university seem to be driven by intuitive assumptions about the economy, market forces, needs-blind admissions, student satisfaction, net price responsiveness, and quality elasticity. The system seems to have strong predictive ability in terms of budgeting gross and net tuition revenues, but does not function well in predicting the impacts of new or changing pricing strategies. Given the decision making process of the school and the number and power of key players, change in the system will have to take place incrementally. Statistical models should be applied to some of the smaller, less entrenched aid programs first to build evidence to support improvements in their design. For example, the net revenue gained from providing talented freshmen with 100 percent tuition scholarships versus 75 percent tuition scholarships could be modeled, taking into account students' choice of college and the persistence rate. There is a need for empirical modeling that can quantify the impact of long-standing assumptions on net tuition revenues. (Contains 22 references.) (JDD)

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TUITION PRICING AND AID STRATEGIES: A PRACTICAL APPROACH

Paper presented at the Annual Forum of the Association for Institutional Research, New Orleans, May 29-June 1, 1994

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Paul L. Fine
Fall 1993

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Jean Endo
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TUITION PRICING AND AID STRATEGIES: A PRACTICAL APPROACH

INTRODUCTION

The wave of restructuring affecting the higher education industry highlights the challenges facing college and university administrators with respect to budget decision making. "In 1991-92, roughly two thirds of public research institutions faced substantial cuts" (Slaughter, 1993). The 1990's have begun as a difficult period for higher education given declining enrollments, (American Council on Education, 1993) reductions in budget-relieving federal grant suppo , (Cordes, 1993) public pressure on tuition rates and rising costs of operations. In response to the above challenges, many institutions restructured to cut costs, or are considering such strategies. With gross tuition revenues representing the single largest revenue item at most private colleges and universities and aid being the second largest expense component after cost of instruction, perhaps the net tuition revenue conundrum is the area more worthy of focus.

Significant research progress has been made in recent years that allows schools to make better quantitative predictions about net revenues given various pricing strategies. Any school can set its price and its various aid strategies, but the variable in the revenue equation that is more difficult to predict is the number of students that enroll and matriculate under each pricing strategy. Ultimately, the question to answer is which pricing strategy yields the highest net tuition revenues assuming the maintenance of certain student quality constraints.

St. John (1992) developed a school specific model for assessing the effects of student

aid on first time attendance and persistence decisions. St. John places the responsibility for the predictions with student financial aid administrators, and his model requires the use of logistic or probit regressions on institutional data. He recommends using a PC version of a standard statistical package such as SAS or SPSS and believes implementation can occur "without major difficulties." Two keys to St. John's approach is first that it relies on institution specific data. Thus, the uncertainties about the impact of student aid on matriculation as described by Tinto (1990) can be confined to the school's specific case. Secondly, the model controls for other variables such as social background and academic preparation. Just as it may be inaccurate to apply standardized price response coefficients developed from national studies (Leslie and Brinkman, 1988) to an individual school, it may be equally inaccurate to apply school specific coefficients generally across all students within that school.

This paper will examine the applicability of such models for one institution of higher education. The school in question is a highly selective, elite priced, private research university in the South. It has approximately 11,500 full time equivalent students split almost equally between the collection of several undergraduate units and its graduate programs including several graduate professional schools. The paper focuses on planning decisions regarding undergraduate tuition and aid strategies. It will not only review the practicality of using a statistical model in the planning process, but it will review the institution's current modelling system. Finally, it will explore or offer some alternatives and enhancements to assist with future decision making.

PROBLEMS WITH DISCOURSE

While St. John's model has been successfully applied (Somers, 1992), it may be ambitious to assume that many financial aid administrators have the statistical expertise to use the model. Of course, with minimal outside assistance, most institutions could adopt the model, but understanding and accepting its results at various levels of institutional decision making is likely to be difficult. Budget officers, senior administrative officials, student groups, faculty committees, and trustees may not fully appreciate the value of the model's results and look toward more understandable generalizations about the enrollment, aid, tuition, and budget balancing puzzle. The institution's collegial approach to pricing decisions leads to an interesting discourse, some of which is described below.

In discussing the use of such models to help set tuition prices at this school, a national study (Fine, 1993) was offered as an example of what might be applied to help determine pricing strategies and predict related enrollments. A member of the school's faculty budget review committee immediately discounted the study and others he was familiar with because of the R-squared of 30%. He believed more predictive ability was needed and suggested that outside factors such as peer pricing and family income changes needed to be accounted for. Certainly, the peer institutional prices are of major concern at this high-priced private university. To ensure a sufficient applicant pool, the school is leery of letting its sticker price get out of line with the competition. The assumption is that students will not even apply, responding only to a gross price, and will never get an opportunity to evaluate an aid offering. Some studies (Gilmour, 1978; Kotler, 1976) support this assumption. They found that

students use sticker price in developing a list of potential schools to apply to or to eliminate schools from a potential pool. Of course, it is only after the application is made that a student will know the aid package and the related net price.

The family income variable is also a major consideration especially on the persistence component of the net enrollment and revenue equation. At this institution, a freshman is given an aid package that meets 100% of his need. His need is determined by the information provided in the standardized student Financial Aid Form, and it is assumed that each student is paying up to his family's maximum capacity. Unless the median family income grows faster than the rise in gross tuition rates, a need-based aid student will have to have his aid package increase by the exact amount by which the tuition increases. Otherwise, the assumption is that the student will not persist because of inadequate resources. From 1983 to 1991, median family incomes grew at an annualized rate of 5.27% per year according to The College Board (1992). This rate was well below the rate of change in gross cost of attendance in private schools. If this relationship continues, aid will have to grow at a faster rate than tuition in order to continue to meet students' financial need. The admissions officer for this private school who offers needs blind admissions and guarantees of meeting 100% of a student's need is quick to explain this relationship. When asked whether the need analysis is so accurate that each need-based student could not take on even a small marginal increase in his financial responsibility, the admissions officer defends his position further. He argues that the university does not want to be in a position to be accused of "bait and switch." Senior administration and faculty are also anxious to avoid such negative perceptions. So, use of a statistical model to predict the net effect of an increase in revenues from greater family contributions and a decrease in revenues from increased attrition is rejected on the basis

of needing to maintain customer satisfaction and in deference to assumptions about perceptions.

In fact, the overall perception and reputation of the university and one's experiences while in school are important factors in and of themselves that decision makers in a practical sense point to when trying to evaluate pricing decisions. There is a concern about how students and parents will react to varying levels of tuition increases. Will the increase be seen as excessive? Will it affect development efforts? Some schools get substantial donations from families of current students. Will the student consumers believe they are getting a fair value for a given price? In faculty budget meetings, the question of value was raised as a key issue. Faculty compared the prices of competing institutions with their university and have revealed their perceptions of the relative quality of the educational product being provided. They fear that the school's price is too high for its relative value and therefore make subjective judgements about sticker prices. These subjective conclusions seem to bear more weight than a numeric model that attempts to quantify the actual change in demand for given changes in price. National journals with wide circulation to the general public are also addressing the value for a given price question (Elfin, 1993). Senior administration is always cautious about what certain pricing strategies will do to the rankings in the national publications. From a persistence standpoint, the decision makers are also supporting Tinto's (1987) attrition model which disregards financial aid and a student's ability to pay but rather focuses on the congruence of the student's aspirations and abilities with the institution's commitments and characteristics. Thus, the pricing issue is a concern, but not so much because of its impact on enrollments but rather because the school wants to have happy customers who perceive they are getting a bang for their buck.

So, intuitive assumptions about the economy, market forces, needs-blind admissions, student satisfaction, net price responsiveness, and quality elasticity seem to drive pricing and aid strategies for this high-priced, selective university. These assumptions are more comfortable to deal with than a statistical model, especially one that does not account for some of the above variables. Thus, the market will dictate a sticker price ceiling. The needs-blind admission policy dictates the maintenance of a tuition/aid relationship given no major long-term changes in median family incomes. Finally, tuition increases are constrained to maintain perceived relative value.

While the above discourse and decision making rationale was recognized as the reality in this case study, there are problems with the nature of the discourse that lead to the conclusions. First, the participants in the decision making process include faculty members who are not trained in enrollment management. Their comments are based on general assumptions about the economics of pricing, but they are not necessarily informed about the specifics of private university price response. Second, assertions are made using assumptions that may or may not be valid. The fear of creating "bait and switch" perceptions has not been tested and is only an intuitive assumption. The assumptions about value perceptions relative to sticker prices is also an untested argument. Finally, the institution analyzed in this case study has recently struggled with the budget constraints referred to in the introduction. That turmoil has influence over the discourse. Concerns about the detrimental affects of certain pricing strategies can get magnified.

CURRENT STRATEGIES

In applying the rationale of the institution's decision makers, the current strategy is for the university's sticker price to be restrained, but it has to increase at least marginally. The school can accurately predict its non-aid related expenses. It knows how many employees it has and can control the pay rate in a non-unionized environment which is true for the school in this review. Other operating costs such as debt service, utilities, library acquisitions, and insurance are also either controllable or predictable. Unless the institution is downsizing, i.e. cutting programs and the related human capital costs, or unless it can afford to give no salary increases and still retain a quality faculty, the institution's costs will likely rise from one year to the next. Inflationary factors will drive up costs such as utilities, library acquisitions, and benefits. Then, the institutionally determined salary increases will be the other primary determinant of the rise in total costs. The total cost figure is then used to set the necessary tuition rate needed to balance the budget. Thus, tuition revenues will have to increase to a level that supports the minimum acceptable salary increase and all other non-controllable but predictable cost changes.

The goal is to find the lowest possible increase that will balance the budget while maintaining persistence rates at historical institutional levels, attract a certain number of first time enrollees, and satisfy the work force. Once that figure is determined, it is evaluated intuitively to see if it violates the comfort level at which students and their families will perceive the rate increase to be "reasonable." From the Fall of 1993 to the Fall of 1994 term, a 5% increase was seen as the intuitive threshold at which current students would be displeased. Thus, salary increases were maximized until the tuition increase ceiling was

approached. At the same time, faculty and senior administrators expressed indifference between various lower tuition increases such as between a 3% and a 4% increase. Also, budget officials did not quantify a difference in net revenue given a higher salary increase and a tuition increase above 5%. However, several recent studies (Fine, 1993, St John, 1990; and St. John, Oescher, and Andrieu, 1992) found that prices and aid impact persistence decisions. However, if need based aid increases with tuition, net price will be unchanged and persistence should be constant. Thus, if the budget officials are accepting the idea that students respond to net price (McPherson, 1978), and that proves to be true, then a consistent persistence assumption given unchange net price would be accurate for budget planning purposes. More recent studies, however, support the idea that students respond to set of prices and aid packages (McPherson and Shapiro, 1991; St. John, 1990a; St. John, 1990b; and St. John and Starkey, 1993). Ignorance of the studies and reliance on tuition was the ultimate approach which lead to a 5% perceived maximum acceptable tuition increase which would support the greatest possible salary increase.

For first time enrollee numbers, the budget is also not changed for various tuition increases within a given range. The assumption is that quality can simply be compromised until the targeted number of matriculants is obtained for this selective institution. In the long run, however, this strategy could be detrimental to the academic quality of the school and its ability to market itself as a selective institution in the future.

Gross tuition revenues are predicted first. A four year rolling average of year to year persistence is calculated by class. Fall actual enrollments are used, and the part-time student head count is divided by three to get an estimated full-time equivalent figure. As an example,

there were 1,596 freshmen in the Fall of 1989. In the Fall of 1990, there were 1,338 sophomores. Thus, the persistence rate from freshman to sophomore year in 1990 was 83.8%. For 1991, 1992, and 1993 the respective persistence rates were 83.3%, 89.8%, and 87.6%. The average of the four years' change is 86.1% which is applied to the 1993 Fall freshman class to predict the number of sophomores that will matriculate in the Fall of 1994.

Might price impact the annual persistence rate or make the average an invalid predictor? Again, using net price as the key to a student's responsiveness, the school's assumption is that for need-based student whose aid is increased in proportion to gross tuition prices there should be no net impact from price changes. For non-need-based students, previous studies (Fine, 1993; St. John, 1990; and St. John, Oescher, and Andrieu, 1992) predict an impact for tuition price changes. It is interesting to note that the lower persistence rates of 83.8% and 83.3% happened in years when tuition prices grew by 9.64% and 9.12% respectively. Persistence improved in 1992 and 1993 to 89.8% and 87.6% when tuition rates increased more slowly in those related years, 7.01% and 1.81%. Table 1 shows the persistence rates for the sophomore to junior and junior to senior years also. It can be seen that the correlation between improving persistence and lower tuition increases does not hold true for these last two year to year categories.

Once a head count for the Fall is predicted, it is adjusted for Fall to Spring attrition and transfers. For example, the Fall of 1992 had an undergraduate full-time equivalent enrollment of 5,689 students. Multiplying this figure by tuition and fees yields $95.3 million in gross revenues. Actual tuition and fees for the school year including the Spring of 1993 was only $93.3 million. Thus, there was a 2.1% decline in revenues due to a 4.2% Fall to

Spring attrition rate. The Fall to Spring attrition rates for the four years ended in the Spring of 1992 ranged from 3.75% to 4.18% with higher attrition in the latter two years than in the earlier two. Since prices did not change from Fall to Spring and since aid is awarded for an entire academic year, it might be assumed that pricing decisions will have little impact on this variable. However, as tuition prices rise and students realize the expense of a first semester, fewer students may persist into the Spring at high absolute prices. The ratio of actual gross tuition revenues to the product of Fall full-time equivalents and gross prices is averaged for the past five years. That average times the projected full time equivalent head count times the next years's gross tuition price yields the projected gross revenues.

Next, the cost of aid must be projected. The school administers several different aid packages. The first is a full tuition waiver for students selected by the city's mayor and state legislators. The cost of the awards changes dollar for dollar with tuition. The number of awards is not controlled by the school, but about 140 such scholarships are awarded annually which is near the maximum available to the government officials. The cost of this program is therefore projected by multiplying the gross tuition rate by 140 awards. Of course, an official could change his award from one student to another in a given year. The student who would lose the full scholarship in say his sophomore year would likely drop out. There is a true cost here if the award is then given to an existing partial or full paying student as opposed to bringing in a new student. This rarely happens, and when it does it should already be accounted for in the gross revenue projections since those projections account for attrition as noted above.

To boost student quality, the school offers a full academic scholarship to 105 of its most talented Freshmen each year. The students maintain these scholarships through graduation and the school assumes it makes a marginal financial return on these students from things such as room and board usage and bookstore purchases. The attrition rate for these students is assumed to be 2% per year. This is a much lower rate than that of the overall student body.

There may be some real opportunity to model the net revenue gained from say a 75% tuition scholarship given that the persistence rate would probably decline below 98%. Assuming the persistence rate falls to that of the general university, there would still be a net budgetary gain of approximately $1.5 million. See Table 2 for the computation of this amount. To avoid the "bait and switch" perception, this change in strategy would have to be phased in, and the $1.5 million would take four years to realize. Perhaps, the biggest problem with such a change is that the university's admissions officer believes that none of these academically talented students will come to the institution without the offer of a full scholarship. This assumption has to be erroneous. For these students to have chosen this institution even given the full aid package suggests that either no other school offered such a generous scholarship or their institution of choice had another attraction that the student might be willing to pay a small price for. Finding the price response coefficient for this group of students could be critical. How many top-quality students will come at what marginal cost? Unfortunately, as a practical matter, senior officials are fearful to experiment with this program. Again, these students support the average SAT scores of the entering freshman class which is a well publicized measure of selectivity and quality.

A middle income scholarship was recently created to serve a segment of students with better than average academic credentials who do not qualify for need, based on federal need calculations, yet still could not afford the full tuition. These students are given a room supplement to promote occupancy in the school's underutilized housing system. They also receive about a 30% discount on their tuition. Since the program is relatively new, the school's traditional model of using historical experience to predict the future cannot be used here. All predictions done with regard to this program are purely subjective and use of a quantitative model here seems extremely appropriate. It is also interesting to note that when the program was started two years ago, the tuition discount was closer to 20%, and 68 freshman qualified and took advantage of the scholarship. The persistence rate for that group going into their sophomore year was only 73.5%. The sophomore to junior year persistence was also less than the overall university average of 90%. In the program's second year with the 20% scholarship only 37 freshmen were attracted, and their persistence rate into their sophomore year was an extraordinarily low 54%. At the 30% discount rate, 68 freshmen were once again enrolled under the scholarship for the most recent year. While the program does add marginal net revenues to the university, the trial and error approach to its implementation seems inefficient. Also, an empirical analysis might help find a higher discount rate that increases persistence to a level that provides a net positive financial benefit to the institution. Conversely, the cost of the program should be compared to the assumed fewer numbers of these students that might enroll without the scholarship and fund their unmet need with private loans.

A fourth program offered by the school is an offer of free room and board to all ROTC students whose tuition is paid by the federal government. This gave the university a

significant competitive advantage in recruiting ROTC students and resulted in a seven fold increase in the number of ROTC freshmen admitted when the strategy was implemented three years ago. With excess dorm capacity at the school, the program seems to be extremely profitable, however, its success looks to be short lived. The military is cutting its educational funding opportunities. Also, it has noticed the disproportionate number of students being attracted to this particular university. This has raised concern and limits are being placed on the amount of funding that the school can receive under this program. However, the university should maximize its opportunity here if one can ignore the sociological effects of a large ROTC program on the overall culture and climate of the institution. Empirical modelling would lend little to the decision making process with regards to this program.

Finally, there is the need based aid program to consider. The institution provides grant aid to meet 100% of a student's need above government grant amounts. Again, the commitment to the needs-blind admissions policy and the avoidance of a "bait and switch" strategy perpetuates this program with all disregard for any statistical analysis that might suggest a more profitable approach. Might lower tuition and lower aid work? In one public school study (St. John, 1991) found this to be a less attractive alternative. Might substituting loan aid for grant aid be useful? Loans do seem to have a positive influence on persistence and enrollment decisions except for low-income and minority students (St. John, 1991), and there is also evidence that loans combined with grants have a greater impact on persistence than grants alone (St. John, Kirshstein, and Noell, 1991). An empirical model may be useful to evaluate this program for this institution.

In total, the five aid programs have an estimated total cost for fiscal year 1995 of $25.8 million. With gross tuition revenues from the undergraduate population projected at $93.3 million, this leaves a net contribution of $67.5 million. This represents about a 28% discount.

POSSIBLE ANALYSIS

Given the decision making process of the school and the number and power of key players, change in the process will have to take place incrementally. Statistical models should be applied to some of the aid programs independently to build evidence to support improvements in their design. Evaluating the smaller programs that are less entrenched first may be the best approach. In this way, support can build for use of new evaluative tools. The middle income program should be evaluated first. The scholarships for talented students would be the next likely candidate. The mayoral and legislative program as well as the ROTC program will be controlled by external forces. The need based program will be the most difficult to approach, however, marginal adjustments may be evaluated such as trading off small amounts of grants for loans. With regards to sticker price determination, the logic of the decision makers appears reasonable. Competition pricing and quality perceptions are important guidelines that the current statistical models do not directly account or.

Overall, the university's current system seems to have strong predictive ability in terms of budgeting gross and net tuition revenues. Back testing the model by comparing budgets to actual reveal about a 1% variance on average in both gross and net categories. The models do not however, function well in predicting the impacts of new or changing pricing strategies.

The institution should be anxious about finding better ways to evaluate such initiatives. St. John's (1992) model might be quite useful here. Finally, the school treats its decisions about price singularly with regards to both first time enrollments and persistence. This review suggests that differential strategies may be appropriate. It is clear that intuitively students react to the pricing differently when they enroll than later in their matriculation. St. John and Starkey (1993) support this idea.

CONCLUSIONS

This case study noted the difficulties of applying the literature to a practical situation in setting pricing strategies for one university. The avoidance of using established models that can help predict enrollments and persistence for given pricing strategies can, however, lead to less than optimal approaches. Intuitive price setting and aid programming is subjective with uncertain results. Also, any questioning of current strategies becomes a perilous process, because there is no objective mechanism for assessing the impact of change. There is a need for empirical modelling that can either refute or support the long standing assumptions displayed in the discourse. it may also quantify the impact of those assumptions on net tuition revenues. Ultimately, this may lead to better pricing strategies which could enhance net revenues and avoid future restructurings.

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TABLE 1

HISTORICAL PERSISTENCE RATES

	Fall 1989 to 1990	Fall 1990 to 1991	Fall 1991 to 1992	Fall 1992 to 1993	Average
Freshman to Sophomore	83.8%	83.3%	89.8%	87.6%	86.1%
Sophomore to Junior	93.3	92.8	93.6	92.3	93.0
Junior to Senior	98.3	99.2	97.8	97.0	98.1
Percent Change in Gross Tuition Price	9.64%	9.12%	7.01%	1.81%	6.90%
CPI - U Percent Change from September to September of Each Year	6.2%	3.4%	3.0%	2.7%	3.8%

TABLE 2

IMPACT OF CHANGE IN ACADEMIC SCHOLARSHIP PROGRAM

Full Scholarship and 2% Attrition

Freshman	105	$1,999,200
Sophomores	103	1,961,120
Juniors	101	1,923,040
Seniors	99	1,884,960
Fifth Year	6	114,240
Total Cost		$7,882,560

75% Scholarship and Normal Attrition

Freshmen	90*	$ 428,400
Sophomores	77	366,520
Juniors	72	342,720
Seniors	71	337,960
Fifth Year	4	19,040
Marginal Net Revenue		$1,494,640

*Assume 90 students can be attracted as first time attendees with a 75% scholarship offer.